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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/270,768	03/17/1999	ALASTAIR SIBBALD	3017/47588	2922

40032 7590 07/30/2004

CREATIVE LABS, INC.  
LEGAL DEPARTMENT  
1901 MCCARTHY BLVD  
MILPITAS, CA 95035

EXAMINER

GRAHAM, ANDREW R

ART UNIT	PAPER NUMBER
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2644

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DATE MAILED: 07/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/270,768

Applicant(s)

SIBBALD ET AL.

Examiner

Andrew Graham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 13-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13-15 is/are rejected.
- 7) ☒ Claim(s) 1, 13 and 14 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 March 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 5.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

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**DETAILED ACTION**

***Response to Request for Reconsideration***

1. Applicant's arguments regarding the restriction, filed May 17, 2004, have been fully considered. The previous requirement for restriction has been withdrawn in view of MPEP 806.05(c). All of the currently pending claims in the case, 1-10 and 13-15, have been addressed in this action.

***Priority***

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Drawings***

3. Figures 2 and 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated, according to page 4, lines 1-2 and page 5, lines 6-7 of the applicant's specification. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

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Figure 13 is also objected to because a legend is required for understanding, as is provided for under 37 CFR 1.85(o). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Claim Objections***

4. **Claims 1 and 13-14** are objected to because of the following informalities:

**Claims 1 and 13-14** fail to meet the requirements of 37 CFR 1.75(i) in regards to the steps (i-iii) in the claims.

Appropriate correction is required.

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***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-2, 5-10, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higashi (USPN 5386082) in view of Searle (USPN 3970787).

Higashi discloses a system for imparting localization effects on an acoustic image. The system receives input from a keyboard (20) and a tone generator (21), which is applied to a pair of FIR filters (22,23) that correspond to the transmission of sound to the left and right ear of a user (col. 4, lines 5-16). The FIR filters (22,23) are connected to a factor table (24), which provides response parameters corresponding to localization coordinates for the acoustic image (col. 4, lines 17-30). This splitting of a monaural source into a stereophonic pair reads on "A method of processing a single channel audio signal to provide an audio signal having left and right channels corresponding to a virtual sound source at a given direction in space" and "providing a two channel signal having the same single channel in the two channels". The FIR filter characteristics incorporate the interruption, reflection, and similar effects

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imparted on a received signal due to the shape of the human skull (col. 3, lines 31-50). A cutoff frequency for low frequency filtering is also included as part of the filters' parameters (col. 5, lines 24-32). The effects imparted by these filters read on "modifying the two channel signal by modifying both of the channels using one of a plurality head response transfer functions to provide a right signal in one channel for the right ear of a listener and a left signal in the other channel for the left ear of the listener". The processed signal is then applied to delay circuits (28,29), which impart a delay based on the direction of a sound relative to a person (col. 4, lines 31-37). Examples of such values are shown in Figure 6, which is interpreted herein to be a table for the left ear of a user. Higashi discloses that such data can be inverted for the application to the opposite ear because of the symmetry of human ears (col. 3, lines 15-17). The delay imparted by the delay circuits (28,29) equates to "introducing a time delay between the channels corresponding to the inter-aural time difference for a signal coming from said given direction". Again, the filter parameters provided to the FIR filters includes a cutoff frequency for performing low pass filtering (col. 5, lines 29-32). This parameter is based on the relative location of an imparted acoustic image, which reads on "filtering the signal in both channels using high frequency cut filter means, the filter characteristics of the HF-cut filter means being settable according to the given direction of the virtual sound source".

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However, Higashi does not specify:

- that the space in which the virtual sound source may be positioned includes a forward hemisphere and a rearward hemisphere

Searle discloses a system for simulating a particular listening space and the reception of sound signals therein. The system of Searle accounts for both azimuth as well as elevation of an incoming signal (col. 4, lines 36-47). These angles are directly involved with the pinna filters (18) applied to an input signal (col. 6, lines 50-68). This three dimensional processing reads on "the space including a forward hemisphere and a rearward hemisphere relative to preferred position". It is further noted that the signal processing includes a head shadow filter (28), which reads on "head response transfer functions", and pinna filters (18), which read on "high frequency cut filter means" (col. 4, lines 44-47). The characteristics of the pinna filters (18) are shown in Figures 2a-2e, wherein the variation in effects applied to the higher frequencies are noticeable between the filters corresponding to the various input angles.

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to modify the filtering of Higashi to include the three dimensional, pinna, and head shadowing effects as disclosed by Searle. The motivation behind such a modification would have been that such filtering would have expanded the possible image location of the virtual

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sound source to include an elevation. The processing of Searle also accounts for reverberation effects, which would have provided the overall system with an additional signal function or capability.

Regarding **Claim 2**, the effects of the pinna filters (18) of the system of Searle can be seen in Figures 2a-2e. As can be seen, the amplitudes of the higher frequencies in Figure 2e are generally lower than those of Figures 2a-2d (table, col.6-7). Figure 2 also illustrates that the 180° angle also receives the highest degree of attenuation (22). Figure 6 of Higashi also supports the concept that the lowest cutoff frequency and lowest amplification factor is at the rear, as the overall left and right attenuation and filtering is greater at the rear angle than at the other combined left and right locations (Figure 6). The values shown in each of these figures generally decrease for the input directions closer to the front of a user. Collectively, these teachings read on "the amount of HF-cut filtering is at a maximum for virtual sound sources placed directly behind the preferred position of a user" and "the amount of HF-cut filtering progressively decreases as the forward hemisphere is approached".

Regarding **Claim 5**, the pinna filters applied to the signals in the system of Searle involve the effects of both an elevation and an azimuth, which in view of the teachings of Higashi reads on "the coefficients of the HF-cut filter means are set according to a function of the angle of azimuth and the angle of elevation



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of the virtual sound source" (col. 6, lines 42-68 and col. 7, lines 1-11).

Regarding **Claim 6**, the values for amplification and low frequency cutoff for the angles on either side of the rear of a user's head are proportionally calculated from the value associated with the rear of a user's head (col. 4, lines 25-30, Higashi). Higashi also teaches that the data can be inverted and applied for a user's ears because of the symmetry of the ears (col. 3, lines 15-17). This collectively reads on "the amount of HF-cut filtering is substantially the same for virtual sound sources placed at positions on the rear hemisphere which are equidistant".

Regarding **Claim 7**, the parameters in the system of Higashi are stored in a filter factor table (44), which reads on "the coefficients of the HF-cut filter means are set via a look-up table" (col. 5, lines 24-32).

Regarding **Claim 8**, Figures 6, 7, and 8 of Searle illustrate head shadow filters (28) in series with pinna filters (18), which in view of the similar filtering of Higashi reads on "the HF-cut filter means is used in series with an HRTF".

Regarding **Claim 9**, Searle discloses that the effects of the head shadow and pinna filters may be combined into a single filter (col. 5, lines 45-51 and Figure 2). In view of the parallel filtering between Searle and Higashi, this reads on "an HRTF is convolved with an HF-cut filter means to produce a modified HRTF".

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Regarding **Claim 10**, please refer above the rejection of the limitations of Claim 1, noting the components utilized in performing the disclosed steps and that Higashi discloses that such a system may be implemented in hardware or software (col. 6, lines 1-2).

Regarding **Claim 13**, please refer above the rejection of the similar limitations of Claim 1, noting that Higashi discloses that such a system may be implemented in software with a CPU(col. 4, lines 55-57).

Regarding **Claim 14**, please refer above the rejection of the similar limitations of Claim 1, noting the signal produced by the system referred to therein.

Regarding **Claim 15**, please refer above the rejection of the limitations of Claim 1, noting the components utilized in performing the disclosed steps and that Higashi discloses that such a system is implemented in hardware (col. 6, lines 1-2).

6. **Claims 3-4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Higashi in view of Searle as applied to Claim 1 above, and further in view of Maher (USPN 6078669).

As detailed above, Higashi teaches a system for imparting a virtual location on an acoustic image. Searle teaches the additional effects of an elevation of a virtual sound source, as well as various filters and filter arrangement for implementing such a system.

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Regarding **Claim 3**, however, Higashi in view of Searle does not specify:

- that there is zero HF cur filtering for virtual sound sources placed at directions of azimuth between  $0^{\circ}$  and  $\pm 90^{\circ}$

Maher teaches another image localization system. The localization effects are imparted in a localization device (16), based on inputs from physical parameters sources (12), such as a computer game environment, and a front end localization device (14), which derives control parameters (22) from the physical parameters (20) (col. 5, lines 19-45 and Figures 1-3). Two of the output parameters of the localization front end (14) are a front and back indicator (22g, 22h) (col. 7, lines 11-15). These signals exclusively zero or one for certain azimuths, with the example ranges being within and beyond  $110^{\circ}$  of the left and right sides of the user (col. 7, lines 15-20). The effect is that signals are passed directly to an output adder when the virtual location is determined to be in a forward angular range, and signals are subjected to additional processing when the virtual location is indicated to be at the rear of a listener (col. 8, lines 43-67). This effect, in view of the signal processing applied by the filters of Higashi in view of Searle, reads on "zero HF-cut filtering for virtual sources placed at directions of azimuth between  $0^{\circ}$ - $\pm 90^{\circ}$ ".

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To one of ordinary skill in the art at the time the invention was made, it would have been obvious to incorporate such direction based processing as taught by Maher in the system of Higashi in view of Searle. The motivation behind such a modification would have been that such processing would have enabled direction specific effects to be applied to certain input signals, while preventing them from being applied to signals with incorrect input directions. Common processing would have yet been applied to all directions of input. The teachings of Maher also include a function for transitioning such effects in and out of application to an audio signal. Such processing and corresponding effects improve the accuracy of the virtual positioning of an audio image.

Regarding **Claim 4**, the system of Searle includes a headset equalizer (502) for outputting the processed signal through a headset, or a loudspeaker equalizer (504) for routing the processed signal through a set of loudspeakers (col. 9, lines 64-66). The loudspeaker equalization circuit (504) includes crosstalk cancellation or compensation, which reads on "the left and right channel signals are processed by transaural crosstalk cancellation means in order to give loudspeaker compatible signals". Such circuitry would have been desirable because it would have enabled the audio signal to be applied to both loudspeaker and headset output systems.

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**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is 703-308-6729. The examiner can normally be reached on Monday-Friday, 8:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen can be reached on (703)305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Ag*

Andrew Graham  
Examiner  
A.U. 2644

ag  
July 26, 2004

*[Signature]*

**XU MEI  
PRIMARY EXAMINER**